Plant Science Pamphlet #65 December, 1981

ANNUAL PROGRESS REPORT

T14

CENTRAL CROPS AND SOILS
RESEARCH STATION

HIGHMORE, SOUTH DAKOTA

BRIEF HISTORY

The 1981 spring grains were planted about a week earlier than 1980, but a period of cold weather slowed germination. Soil moisture was adequate in the top 6 inches whereas the subsoil was dry. Total rainfall for April was 42 hundreths of an inch which evaporated during the windy spells. May and June had below normal rainfall and July an August were above normal for the growing season.

Fall and winter plantings for the 1981 harvest were slow starting until rainfall occurred in October. A February 23, 1981 planting was made of a winter wheat and a spring wheat. Both crops came up and produced satisfactory yields.

This year some plant introductions were planted, namely Tyfon and Kenaf. Tyfon is a green-chop or silage type broadleaf crop. Kenaf is a fiber or silage crop but is definitely not for areas of less than 40 inches of rainfall.

The acreage on the station taken out of experimental work was planted to millet. Four varieties: Manta and Sno Fox (foxtails), and Cerise and Minsum (prosos), were increased for Foundation Seed.

A twilight tour of the Central Research Station research and facilities was conducted July 1st.

The new officers for 1982 are Doug Meyer of Beadle County, President; Jay Pugh of Hand County, Vice President; and Dick Fadgen of Beadle County, Secretary. The new advisors are Doug Marsh and Jake Vilhauer for 1982-1985.

A field day tour is set for June 30 or an alternate day of July 7, 1982.

The Annual Advisory Board Meeting for the Central Research Station is to be conducted January 12th or 19th in 1983.

NOTE: This is a progress report and, therefore, the results presented are not necessarily complete nor conclusive. Any interpretation given is strictly tentative because additional data from continuation of these experiments may produce conclusions different than those of any one year. These data reflect the 1981 growing season.

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AGRICULTURAL ADVISORY GROUP

Central Research Station, 1981

Highmore, South Dakota

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Doug Marsh	Onida	Sully County	78-81
Mike Volek	Highmore	Agricultural Technician	
Quentin Kingsley	SDSU	Station Manager	

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Hollis D. Hall, Director

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Dick Fadgen	Huron	Beadle County
Ray Larsen	Faulkton	Faulk County
Wayne Nesby	Miller	Hand County
Robert Edwards	Pierre	Hughes County
Robert Fehr	Highmore	Hyde County
Albert Ullmer	Gettysburg	Potter County
County Extension Office	Onida	Sully County

1981 Crop Season

Total Rainfall for Growing Season by months with their Departure from Long-time average on Central Research Station, Highmore, S.D.

Rainfall	Inches	Departure*	Greatest Day	Date
April	0.42	-1.45	0.15	3
May	1.98	-0.57	0.37	27
June	2.51	-1.46	0.46	14
July	8.50	+5.96	5.90	2
August	5.47	+2.02	0.95	3-22
September	0.22	-1.39	0.10	26
October	2.38	+1.13	0.80	13

Number of days during month with temperature 90° or above: June 4; July 10; August 4; September 6.

Last frost - Spring (June 2)
First frost - Fall (October 7) Frost free period - 127 days

*Departure from longtime rainfall average April through October: +5.34 inches on the Central Research Station.

CROP ROTATION - SOIL MOISTURE USAGE RELATIONSHIP 1981

Q. Kingsley and M. Volek

OBJECTIVE OF EXPERIMENT:

1. To compare various crops with different maturities for soil moisture usage and yielding ability under similar soil and climatic conditions.

DISCUSSION:

Crops chosen for this experiment are of different maturities. Barley, oats and wheat are the shorter seasoned crops and corn, grain sorghum and sunflowers are the long season crops. Planting and harvest dates are the same as * Inches used period.

Sunflowers had Tolban applied at 1 pound per acre preplant incorporated for weed control.

Bird damage was excessive in the grain sorghum and sunflower experimental areas. The sunflowers were cut for silage to salvage that much of the crop.

RESULTS: Central Research Station, Highmore, S.D. 1981

Table 1

Crop	Yield in Bu or lb/A	Moisture loss from profile plus precip. inches used*	Bu/or Lbs. per Inch of Water Used**	Test Weight or % H_2O Present	Protein or Oil
Barley					
Primus II	56.2	13.3	4.23	43.7	13.4
Oats					
Nodaway 70	77.6	13.5	5.75	35.5	14.2
Wheat					
James	31.1	14.5	2.14	53.8	17.4
Corn					
Pioneer 3906	61.2	18.9	3.24	35.5%	12.4
Sorghum					
Western 203	1863.5#	18.0	103.53#	25.2%	
Sunflower					
IS 3100	2.9 ton	18.3	0.16 ton		13.0

* Inches used: Includes 13.3 inches of rain from April 10 to July 22 for barley, and oats. Wheat 14.5 inches April 10 to July 30
Grain Sorghum - June 4 to October 12, 18.0 inches
Corn - May 18 to October 12, 18.9 inches
Sunflowers - May 18 to September 18, 18.3 inches

**Calculated by: $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used.

HAY, HAYLAGE AND SILAGE PRODUCTION
Central Research Station, 1981
Q. Kingsley and M. Volek

TITLE: Dry Matter Production for Small Grains, Millet and Forage Sorghum.

OBJECTIVES OF EXPERIMENT:

1. Compare various crops for dry matter production.
2. Obtain regrowth data after first harvest for green chop or haylage.

DISCUSSION:

Four oat varieties of various degrees of maturity were used for this study. The percent protein is highest in the milk stage but decreases with maturity. Highest yields in tons per acre occurred during the dough stage. The medium late variety produced the most grain with 17.6 percent protein.

RESULTS:

Table 2. Small Grain Haylage, Tons of Dry Matter* (DM) per acre at stages of maturity. First planting April 9, 1981

	Yield in tons per acre							
Variety and Maturity	Milk 6/22	% Protein	Dough 7/8	% Protein	Late Dough 7/15	% Protein	Grain Bu/A 7/24	% Protein
Burnett Medium E.	1.75	12.2	2.71	10.4	1.85	9.3	76.4	16.4
Lancer Medium	1.93	14.0	3.27	9.4	2.53	9.4	80.1	17.5
Nodaway 70 Early	2.02	13.0	3.11	10.8	2.57	9.1	84.0	14.4
Benson Medium L.	1.50	13.1	3.13	10.1	3.23	9.6	87.0	17.6
Average	1.83		3.06		2.80		81.9	

Hay (88% DM); Haylage (50% DM); Silage (33% DM)

*To determine yields of hay, haylage or silage: Divide tons of DM by percent DM in hay, haylage or silage. Example (DM average for dough of 3.06 if divided by 0.88 equals 3.48 tons of 12% moisture hay, etc.)

Harvested: Listed above under column heading.

DISCUSSION:

The reduced yields of oats of the second date of planting, May 6, were subjected to drier soils and little rain in the early stages of growth. The percent protein compares favorably with those in Table 2 for stages of harvest, but grain yields were reduced because of the time it lay in the windrow and bird damage.

RESULTS:

Table 3. Small Grain Haylage, Tons of Dry Matter* (DM) per acre at stages of maturity. Second planting May 6, 1981.

Variety and Maturity	Milk 7/8**	% Protein	Dough 7/23	% Protein	Late Dough 7/30	% Protein	Grain Bu/A 8/4	% Protein
Burnett Medium	1.34	16.1	2.10	10.8	1.62	8.4	20.3	17.4
Lancer Medium E.	1.15	13.0	1.74	12.7	1.35	10.5	10.2	19.1
Nodaway 70 Early	1.61	13.4	2.02	10.6	1.95	10.9	18.2	15.9
Benson Medium L.	1.07	14.5	1.92	11.4	1.59	10.8	9.1	19.2
Average	1.29		1.95		1.63		14.5	

*Refer to Table 2 to determine yield at various stages
**Harvested: Listed above under column heading

FORAGE SORGHUM - MILLET

DISCUSSION:

The tonnage produced from these various forage crops reflects the environmental conditions during 1981. Yields were taken at the green chop, regrowth after green chop and at silage cutting time. Each entry including Sudan grass were put into a Type Category, but were ranked according to yield. The crops in Tables 4, 5 and 6 were planted in 36 inch rows and those in Table 7 were planted with a grain drill. In years of lower rainfall, the heights would be much shorter as in 1980. Corn was cut for silage only and should be included in Table 6 on page 8. The corn used was NK HS105 at 20,000 plants per acre. The tonnage produced, oven dry, was 6.86 tons, moisture when cut was 55.8 percent, 9.2 percent protein and plant height of 62 inches.

Table 4. Forage Study 1981-Central Station, Highmore, SD, Green Chop.

Entry	Overall Rank	Dry Yield Ton/A**	Percent Protein	Plant Height Inches
Sudan				
NK Trudan 8	27	2.32	14.3	74
Paymaster HS33	11	2.77	13.9	66
Forage				
NK 326	10	2.82	14.6	75
*NR Early African Millet	30	2.14	15.6	66
NR Atlas	6	3.30	15.7	73
NR Sumac F6550	3	3.61	15.2	66
NR Kansas Drange	34	1.97	14.5	76
NR Early Sumac	2	3.62	15.4	73
NR Sugar Drip	38	1.77	15.9	72
NR Ellis Sorgo	39	1.70	15.3	68
NR Rox Drange	7	3.17	15.2	67
NR Leoti Red	29	2.60	14.4	75
NR Hegari	24	2.46	14.6	63
NR Sweet 'N Red Hybrid	16	2.68	15.0	74
Sorgo X Sorgo				
NK X 8041F	21	2.50	16.1	75
Cenex Sweet Suso	19	2.59	14.8	80
Forage X Sudan				
Cenex-Highland Sweet	17	2.65	14.7	74
Cenex-Highland Sweet II	23	2.49	14.0	76
Paymaster-Sweet Sioux III	22	2.50	14.4	79
NR-Sunny Sue	1	4.15	13.8	87
NR-Sweet Sunny Sue	5	3.37	15.6	79
NR-Sunny Sweet	28	2.66	15.0	80
Grain X Sudan				
DeKalb-ST-6+	4	3.49	14.2	80
NK-Sordan 79	35	1.96	15.8	81
Pioneer-988	13	2.71	17.5	79
Grain X Forage				
DeKalb-FS-4	8	2.99	14.3	74
NK-X7984F	18	2.62	15.0	77
Pioneer-956	36	1.86	15.9	74
" -947	25	2.42	15.9	67
" -927	9	2.97	15.0	65
" -911 (Leafy)	31	2.12	15.6	73
Cenex-#700 T	14	2.69	15.2	62
Dual Purpose				
DeKalb-FS-1a	32	2.09	14.8	61
NK-NK300	40	1.66	14.9	61
NK-Silo Milo 2	26	2.41	14.9	65
Forage Leafy				
Dekalb-FS-25at	33	2.02	12.9	73
NK NK367	20	2.51	14.8	80
Paymaster-FS531	12	2.76	14.9	78
Sorghum-Unknown				
Paymaster FS 451	15	2.69	14.8	76
Paymaster FS 461	37	1.84	15.2	67

NR = Newell Rose. LSD Using Waller-Duncan 0.95; C.V. 21.26; Rainfall 6/4 - 8/11 = 13.0 inches; Planted: 6/4; Harvested: 8/11. All yields are reported on an oven dry basis.

**Formula same as Small Grain Haylage, Table 2.

Table 5. Forage study 1981-Central Station, Highmore, SD, Green Chop Regrowth.

Entry	Rank	Dry Yield Ton/A	Percent Protein	Plant Height Inches
Sudan				
NK Trudan 8	7	2.10	14.7	42
Paymaster HS33	3	2.39	13.8	48
Forage				
NK 326	6	2.12	15.5	40
*NR Early African Millet	4	2.28	16.4	38
NR Atlas	25	1.22	16.9	30
NR Sumac F6550	21	1.28	17.9	26
NR Kansas Orange	18	1.38	17.7	27
NR Early Sumac	38	0.66	17.0	27
NR Sugar Drip	8	2.04	18.3	28
NR Ellis Sorgo	No test			
NR Rox Orange	23	1.25	17.3	28
NR Leoti Red	5	2.22	18.3	24
NR Hegari	11	1.69	17.4	26
NR Sweet 'N Red Hybrid	33	0.87	18.4	24
Sorgo X Sorgo				
NK X 8041F	24	1.24	17.5	26
Cenex Sweet Suso	20	1.31	17.2	25
Forage X Sudan				
Cenex-Highland Sweet	30	0.95	16.6	28
Cenex-Highland Sweet II	1	2.45	15.6	24
Paymaster-Sweet Sioux III	10	1.71	15.3	38
NR-Sunny Sue	26	1.22	16.1	24
NR-Sweet Sunny Sue	2	2.42	16.8	29
NR-Sunny Sweet	16	1.40	17.0	40
Grain X Sudan				
DeKalb-ST-6+	32	0.87	15.7	32
NK-Sordan 79	13	1.53	15.4	42
Pioneer-988	14	1.48	18.8	40
Grain X Forage				
DeKalb-FS-4	17	1.38	18.4	39
NK-X7984F	28	1.10	18.4	41
Pioneer-956	19	1.32	18.8	40
" -947	35	0.77	19.6	45
" -927	12	1.65	15.2	39
" -911 (Leafy)	36	0.77	19.6	38
Cenex-#700 T	15	1.45	18.4	26
Dual Purpose				
DeKalb-FS-1a	22	1.26	16.6	29
NK-NK300	29	1.08	17.6	25
NK-Silo Milo 2	37	0.75	19.8	27
Forage Leafy				
Oekalb-FS-25at	39	0.52	20.8	27
NK NK367	31	0.95	17.4	27
Paymaster-FS531	27	1.05	17.7	27
Sorghum-Unknown				
Paymaster FS 451	9	1.87	15.7	25
Paymaster FS 461	34	0.82	14.3	27

NR = Newell Rose. LSD Using Waller-Duncan 0.50; C.V. 23.17; Rainfall 8/11-9/24 - 3.07 inches; Regrowth is from Green Chop cutting time 8/11 to 9/24. All yields are reported on an oven dry basis.

Table 6. Forage Study 1981-Central Station, Highmore, SD, Cut For Silage.

Entry	Overall Rank	Dry Yield Ton/A	Percent Protein	Plant Height Inches
Sudan				
NK Trudan 8	30	6.69	9.4	117
Paymaster HS33	32	6.59	8.0	114
Forage				
NK 326	10	8.52	9.6	113
*NR Early African Millet	25	6.95	8.9	114
NR Atlas	17	7.91	9.6	120
NR Sumac F6550	16	8.00	9.3	116
NR Kansas Orange	6	9.27	10.1	119
NR Early Sumac	40	5.68	8.9	118
NR Sugar Drip	39	5.89	9.4	128
NR Ellis Sorgo	4	9.53	9.4	112
NR Rox Orange	23	7.13	9.3	110
NR Leoti Red	34	6.55	11.7	118
NR Hegari	5	9.53	8.6	64
NR Sweet 'N Red Hybrid	37	6.21	8.1	115
Sorgo X Sorgo				
NK X 8041F	13	8.27	9.1	116
Cenex Sweet Suso	19	7.73	9.7	121
Forage X Sudan				
Cenex-Highland Sweet	7	9.01	10.6	118
Cenex-Highland Sweet II	2	9.68	9.3	118
Paymaster-Sweet Sioux III	11	8.51	8.6	130
NR-Sunny Sue	8	8.85	9.6	122
NR-Sweet Sunny Sue	28	6.83	8.6	133
NR-Sunny Sweet	33	6.59	9.7	80
Grain X Sudan				
DeKalb-ST-6+	22	7.20	10.6	122
NK-Sordan 79	31	6.68	10.7	116
Pioneer-988	27	6.91	8.9	125
Grain X Forage				
DeKalb-FS-4	38	6.02	8.6	120
NK-X7984F	1	10.39	8.6	114
Pioneer-956	12	8.45	10.7	125
" -947	29	6.79	6.7	119
" -927	20	7.52	8.9	67
" -911 (Leafy)	26	6.93	9.1	125
Cenex-#700 T	9	8.77	12.4	70
Dual Purpose				
DeKalb-FS-1a	24	7.10	11.4	69
NK-NK300	15	8.03	10.4	111
NK-Silo Milo 2	36	6.23	9.8	78
Forage Leafy				
Dekalb-FS-25at	35	6.42	9.3	109
NK NK367	21	7.20	11.6	125
Paymaster-FS531	3	9.56	10.7	125
Sorghum-Unknown				
Paymaster FS 451	18	7.81	8.3	65
Paymaster FS 461	14	8.17	10.4	75

NR = Newell Rose. LSD Using Waller-Duncan 0.69; C.V. 7.65; Rainfall 6/4 - 9/24 = 16.02 inches; First frost September 17; Planted: 6/4; Harvested: 9/24. All yields are reported on an oven dry basis.

Table 7. 1981 Sudan and Millet Variety Trials, Central Crops and Soils Research Station-Highmore, SD, Quentin Kingsley and Mike Volek, Investigators, Waller-Duncan K-Ratio T Test for Variable Yield. Means With The Same Letter Are Not Significantly Different

Entry	Grouping				Dry Yield Tons/A*	Plant Height Inches	% Protein
HS 39005, Sudan			A		5.23	74	14.8
Trudan 8, Sudan	B		A		4.96	74	14.2
HS 33, Sudan	B		A	C	4.56	66	15.1
Monarch II, Sudan	B		A	C	4.53	60	15.9
HS 30105, Sudan	B	D	A	C	4.47	61	14.0
Serere, Foxtail	B	D		C	4.36	79	15.1
Manta, Foxtail		D	E	C	3.87	44	14.1
German Millet, Foxtail		D	E	C	3.82	50	14.2
Sno Fox, Foxtail		D	E		3.62	40	15.9
RMP Foxtail		D	E		3.61	52	16.1
Minsum, Proso			E		3.29	45	12.5
Cerise, Proso			E		3.15	49	12.8

LSD: 0.86#; C.V.: 12.07%; Rainfall: 6/4 - 8/10 = 12.46 inches; Planted: 6/4; with grain drill
Harvested: 8/10
*Formula same as Small Grain Haylage, Table 2.

PLANT INTRODUCTIONS

TITLE: Plant introductions for livestock feed or alcohol production.

OBJECTIVES OF EXPERIMENT:

1. Study adaptability of various crops to South Dakota climate.
2. Do these introductions fit into our cropping sequences?
3. Obtain data of yields and other pertinent information.

DISCUSSION:

Four crops were looked at this year, namely: Kenaf, Rape, Tyfon and Fodder beets. Kenaf is a tall growing plant requiring about 40 inches of water and a long growing season. Its main use is for fiber production but may be used for silage if harvested in a succulent stage. Kenaf is not adapted to South Dakota dryland conditions. Rape is an easy crop to grow and could be used as a rotated pasture, green chop or let go for seed harvest. The crop is susceptible to flea beetles and grasshoppers. Recovery is rapid after harvest and produces more foliage. Tyfon is a forage crop which is a cross between Chinese cabbage and a turnip. This crop will stand a rotated pasture program the same as Rape. Main differences between Rape and Tyfon is that Tyfon may be fed to dairy cattle without tainting the milk. Tyfon can be green chopped or put up for silage. The stems and leaves are large and produce a lot of dry matter containing a high percent of protein. Fodder beets were grown for two reasons, one for cattle feed production and secondly for alcohol production. The yields of taps and root are relatively high and readily eaten by animals.

Results of the 1981 study are presented in Table 8, from one harvest only.

RESULTS:

Table 8. Plant Introductions, Tons of Dry Matter* (DM) Per Acre.

Entry	Tons DM* per acre	Percent protein
Kenaf	8.7	15.0
Rape	11.2	22.3
Tyfon	10.9	26.4
Fodder Beet Greens	3.9	25.4
Fodder Beet	26.9	16.6 gal alcohol/ton

*DM: Dry matter is oven dried.

TILLAGE AND PLANTING METHODS
Q. S. Kingsley and M. Volek

TITLE: Tillage and Row Crop Planting Methods.

OBJECTIVES:

1. Compare various row crop responses to tillage methods, namely: chisel plow, plow and no till.
2. Compare conventional, lister and furrow type plantings using corn, grain sorghum and sunflowers.
3. Determine soil moisture usage for each crop, planting and tillage method.

DISCUSSION:

This experiment was started in 1981 on a summer fallowed piece of ground. A 4 acre piece was planted to wheat in preparation for the no till, plow and chisel plow phase of this experiment in 1982. Yields were taken from all crops to determine if planting method had much effect.

Sparrows and blackbirds reduced yields considerably. The sunflowers were completely harvested by the birds and no type of salvage was performed.

RESULTS:

Table 9. Tillage Study, Central Research Station 1981.

Planting Method	Crop*	Yield 12% H_2O Bu/A	% Protein	% Moisture
Conventional	Corn	69.0	12.1	27.7
Furrow	Corn	58.8	11.0	31.0
Lister	Corn	62.0	11.7	28.6
		#/A	Test Wt.	% Moisture
Convention	Grain Sorghum	1371.8	52.5	30.3
Furrow	Grain Sorghum	1434.6	53.0	30.3
Lister	Grain Sorghum	1461.0	52.5	30.3

*Crops: Corn - Pioneer 3906, planted 5/6; harvested 10/8
Grain Sorghum - Western WS 203, planted 6/4, harvested 10/12
Sunflowers - Interstate 3100

SAFFLOWER TRIALS

TITLE: Safflower Trials and Planting Dates

OBJECTIVES:

1. What entry performs most satisfactorily in this area of South Dakota?
2. Will various dates of planting affect the yield and physical conditioning of the crop?

DISCUSSION:

Tolban was applied to the safflower fields pre plant and incorporated. Safflower are usually planted early in the spring, but a June 4th planting of S-541 produced the highest yield in pounds per acre and percent protein. The crop did not reach the height of early planted crops, but produced large seed heads.

This experiment will be expanded in 1982 where every other seed cup will be plugged. The wide row space may provide more soil moisture availability. Dates of planting may be added also.

RESULTS:

Table 10. Safflower Variety Yields, Central Research Station, Highmore, SD 1981.

Entry	Yield lbs/A	Test Weight	Percent Oil
S-208	748.7	29.0	28.8
Sidwill	1016.3	32.0	23.3
Hartman	766.8	32.5	31.2
Rehbein	1079.9	34.0	31.0
S-541	1393.6	35.0	41.1

Planted: S-208, Sidwill, Hartman and Rehbein were planted April 16; harvested August 12. Rainfall April 16 - August 12, 15.6 inches.
S-541 was planted June 4, harvested September 16. Rainfall, 16 inches.

MISCELLANEOUS OBSERVATIONS
Q. Kingsley and M. Volek

DISCUSSION:

The following grain crops were planted on the Central Research Station, Table 11 to find out if in an "open winter" a winter or spring crop of wheat could be planted. The surface soil was loose and the seed covered well. A period of cold weather followed and the winter wheat then germinated when the soil warmed up and produced a crop. Spring wheat also lay dry until spring and started to grow when the soil warmed up.

In Table 12, the land had Tolban applied at 1 quart per acre and incorporated pre plant. This was not to be, but the spring wheat was affected early in the season. Later on the wheat recovered and stooled out to produce a satisfactory yield. This practice is not recommended.

The grain sorghum trial, Table 13, was damaged about 35 percent by birds. In a larger field, this damage would be reduced considerably.

RESULTS:

Table 11. Winter plantings of spring and winter wheat. Bushels per acre and percent protein, Central Research Station 1981.

Variety	Yield in Bu/A	Test Weight	Percent Protein
Winoka Winter Wheat	32.5	56.0	16.4
Butte Spring Wheat	45.2	54.0	18.5

Planted: February 23, 1981; Harvested July 31, 1981.

Table 12. Spring Wheat Planted in the Spring.

Variety	Yield in Bu/A	Test Weight	Percent Protein
James, HRS	45.1	55.0	17.0

Planted: April 16; Harvested: July 30, 1981.

Table 13. Grain Sorghum Trial.

	Yield in #/A	Test Weight	% Moisture in Grain
WS 203	2477.0	56.0	25.0
Pioneer 894	2019.8	50.0	31.0

Planted: June 4. Harvested: October 8, 1981. Rainfall: 17.4 inches

1981 Performance Trials with Small Grains at the Central Research Station

J. J. Bonnemann and G. W. Erion

The 1981 Small Grain Variety Trials at the Central Research Station were generally in the good to excellent yield range for that area of South Dakota. The mild, open winter left adequate stands of winter wheat and the mean yield of the trial was 58.6 B/A. Quality was generally good and test weights in the 59-60 lb/B range.

The spring grain trials were seeded on April 10 into a firm seedbed with adequate soil moisture for uniform germination. Timely precipitation occurred to maintain the trials until late June when generous amounts of precipitation began and continued through July. Adequate moisture and the absence of continuous days of excessive heat and drying winds favored good to excellent yields of nearly all spring seeded small grain under trial.

Spring wheat yields in the trials averaged 45.2 B/A; the range going from 51.2 down to 37.3 B/A. Oat yields ranged from 94.2 down to 70.8 B/A; the trial mean being 84.3 B/A. The barley trials averaged 59.3 B/A; ranging from a low of 49.4 up to 68.1 B/A. Durum was seeded in 1981 after an absence of several years. The wetter, cooler weather permitted development of favorable yields; the mean yield was 46.4 B/A.

The results are reported in Tables 14, 15, 16 and 17. Results of the remaining Standard Variety Small Grain Trials conducted in 1981 by the project are published in Pamphlet #62 of the Plant Science Department, November, 1981.

Table 14. 1981 Standard Variety Winter Wheat Trials.

Variety	HIGHMORE[a] 1976	1978	1981	3-yr	1981 Test Weight	3-yr
	Bushels Per Acre					
Agate	19.2	40.3	59.8	39.8	60	60
Archer			66.7		59	
Bennett		41.4	55.0		60	
Buckskin	20.3	34.8	58.1	37.7	59	59
Centurk 78		29.0	62.5		61	
Dawn			59.2		60	
Eagle	23.3	26.2	57.4	35.6	60	60
Gent	23.5	34.8	53.7	37.3	60	60
Lancer	23.5	35.4	53.3	37.4	59	59
Larned			55.7		60	
Nebred	22.6	36.3	53.0	37.3	59	59
Nell		37.8	55.7		60	
Newton			59.2		59	
Rall	25.3	33.5	57.8	38.9	60	60
Rita		33.3	60.2		56	
Rocky			62.2		61	
Rose			57.1		59	
Roughrider		28.8	43.5		58	
Sage	26.6	32.9	56.6	38.7	59	60
Scout 66	25.3	37.8	56.2	39.8	60	60
TAM 105			66.1		60	
Winoka	24.6	35.6	55.1	38.4	60	60
Mean			58.6		60	
LSD (.05)			7.7			
CV - %			10.5			

a - Data reported for years when stands survived.

Table 15. 1981 Standard Variety Spring Wheat Trials.

Variety	HIGHMORE 1978	1980	1981	3-yr	1981 Test Weight	3-yr
	Bushels Per Acre					
Standard/mid-tall						
Fortuna	27.6	16.9	43.3	29.3	54	56
Chris	21.4	20.0	38.0	26.5	57	57
Waldron	26.2	17.1	46.3	29.9	55	54
Alex (ND 550)		20.2	43.8		58	
Lew		18.0	42.2		56	
Butte	31.6	13.6	43.5	29.6	59	58
Eureka	26.5	14.7	40.0	27.1	53	54
Coteau	24.7	21.0	41.2	29.0	57	57
James	30.8	17.2	49.2	32.4	53	56
Pondera		22.4	50.3		56	
MPV-2			37.3		56	
MPV-3			42.0		57	
Semi-dwarfs						
Era	26.3	19.8	45.3	30.5	56	55
Olaf	33.8	19.3	47.8	33.6	56	56
Prodax	28.5	23.7	42.2	31.5	53	53
Protor	27.7	15.2	49.8	30.9	55	57
Angus	30.7	23.9	47.4	34.0	58	58
Len	31.9	22.1	40.8	31.8	58	56
715			51.2		56	
Walera			45.9		56	
Solar	30.0	22.9	41.4	31.4	53	55
711		18.1	47.6		56	
Oslo		14.1	47.2		56	
Aim	33.2	15.9	49.8	33.0	55	57
906R	30.9	18.3	50.9	33.4	54	56
Means			45.2		56	
LSD (.05)			6.5			
CV - %			10.3			

Table 16. 1981 Standard Variety Oat Trials.

Variety	HIGHMORE					
	1979	1980	1981	3-yr	1981	3-yr
	Bushels Per Acre				Test Weight	
Burnett	47.0	35.4	78.3	53.6	36	34
Nodaway 70	48.2	33.8	86.1	56.0	38	36
Chief	49.4	34.8	83.9	56.0	36	35
Otee	42.6	32.5	78.9	51.3	37	35
Dal	52.1	34.0	72.9	53.0	34	34
Noble	42.4	28.6	83.9	51.6	36	35
Lyon	53.9	41.7	81.9	59.2	34	34
Bates	44.4	49.0	88.1	60.5	36	34
Wright	51.7	34.8	86.8	57.8	38	36
Otana	64.1	49.0	93.2	68.8	33	34
Lancer	64.3	42.1	87.8	64.7	36	34
Lang	53.6	41.5	93.0	62.7	35	32
Benson	57.6	32.8	79.9	56.8	34	33
Moore	55.7	50.8	92.8	66.4	33	34
Marathon	56.6	44.1	70.8	57.2	32	31
Larry	62.2	37.6	92.7	64.2	35	34
Ogle	65.1	53.4	94.2	70.9	31	30
Stout	51.4	40.0	88.4	59.9	36	34
Means			84.3		36	
LSD (.05)			7.6			
CV - %			6.4			

Table 17. 1981 Standard Variety Barley Trials.

	HIGHMORE					
	1979	1980	1981	3-yr	1981	3-yr
	Bushels Per Acre				Test Weight	
Firlbecks III	48.7	27.4	53.2	43.1	47	47
Larker	38.3	27.6	61.0	42.3	46	47
Primus II	30.8	18.7	49.4	33.0	48	47
Klages		18.5	53.0		45	
Glenn	39.4	22.4	66.1	42.6	44	43
Morex	45.5	22.5	58.8	42.3	45	45
Clark			68.1		48	
Bumper			64.8		43	
Onda			65.1		44	
Means			59.3		46	
LSD (.05)			7.5			
CV - %			8.8			

Table 18. 1981 Standard Variety Durum Wheat Trials.

	HIGHMORE	
	Bushels Per Acre	Test Weight
Rolette	44.3	60
Ward	46.4	60
Crosby	43.2	59
Rugby	39.9	59
Botno	47.1	59
Edmore	48.3	60
Vic	48.8	60
Cando*	50.9	59
Calvin*	49.1	59
Means	46.4	59
LSD (.05)	3.4	
CV - %	7.9	

TESTS OF WINTER WHEAT AT HIGHMORE IN 1981

D. Wells

The environment for winter wheat was unusually favorable producing stands and seed yields that were high.

Yields of the four check varieties in five different tests are given in Table 19. Centurk 78 at 59 bu/acre yielded the most.

Also given in Table 19 are the identities and yields of the highest varieties and highest experimental lines in those tests.

SD 76709 is from the cross Centurk*5/Hand. It is a potential new variety because of its higher seed protein compared with Centurk, excellent milling and baking qualities, high yield of seed, short straw and strong straw.

Rose, SD 7279 was released in 1981. In 1980 across 6 sites in the northern region, it average 75% survival while Roughrider averaged 77% survival. Rose usually is less hardy than Roughrider but is hardier than varieties that are commonly grown such as Scout 66, Sage and Centurk. At Highmore in 1981, Rose, Table 20, yielded 57 bu and Roughrider 44 bu/acre. Its hardiness, excellent straw and good yield recommend it for use in the Highmore area to anyone wanting to produce winter wheat. It is, however, of about the same maturity as Roughrider.

In the regional yield test, Rose yielded 47 bu and Roughrider 41 bu/acre.

Table 19. Yields of Check Varieties in Winter Wheat Tests at Highmore, 1981.

	Tests in which the checks occurred					
		State-wide				Avg. of 4 Tests
	Test	WW1	WW2	WW3	WW4	
			Bushels			
Check Varieties:						
Centurk 78	63	59	57	57	62	59
Scout 66	56	58	57	50	53	55
Buckskin	58	60	50	48	46	54
Winoka	55	49	45	52	--	50
Highest Variety:						
Archer	67					
Buckskin		60				
Centurk 78			57			
Centurk 78				57		
Centurk 78					62	
Highest Line:						
a/SD 76709	65					
b/SD 75115-3		61				
SD 75421-1			65			
SD 791036				57		
CO 745775-4					59	

a/ SD 76709 is 1% point higher in seed protein than Centurk 78 and is resistant to leaf rust.

b/ SD 75115-3 is 1% point higher in seed protein than Centurk 78.

Table 20. Winter Wheat Trials (Continued)

Entries	Yield bu	Test Wt. lbs.
Archer	66.7	59
TAM 105	66.1	60
SD 76709	64.7	59
SD 76705	64.6	60
CO 745597	64.1	61
NE 75414	63.4	59
SD 74221	62.7	61
"Norstar"	62.6	60
Centurk 78	62.5	61
Rocky	62.2	61
NE 77663	61.9	60
SD 76598	61.8	60
Rita	60.2	56
Agate	59.8	60
Dawn	59.2	60
Newton	59.2	59
Buckskin	58.1	59
Rall	57.8	0
Eagle	57.4	60
Rose	57.1	59
Sage	56.6	59
Scout 66	56.2	60
MT 7431	56.2	59
Larned	55.7	60
Nell	55.7	60
Winoka	55.1	60
Bennett	55.0	60
SD 75284	54.7	59
Gent	53.7	60
ND 7481	53.4	57
Lancer	53.3	59
Nebred	53.0	59
Roughrider	43.5	58
Mean	58.4	
CV	11%	
LSD .05	7.9	

SPRING WHEAT BREEDING - HIGHMORE 1981
D. Keim and K. Sellers

Table 21. Grain Yield

Variety	Pedigree	Entry No.	1981	1980	Ave.	Test Weight	Days to Head	Height	Rust Reaction
			Bu/Ac			#/Bu		(in.)	
	Eureka	1	29.9	18.1	23.6	56.0	67	34	5MS
	Era	2	28.9	20.9	24.9	54.7	69	28	5MS
	Olaf	3	28.7	18.1	23.4	57.2	69	28	TMS
	Len	4	23.8	--	--	53.4	68	29	TR
	Butte	5	27.9	15.7	21.8	58.5	62	32	TMR
	Protor	6	30.5	13.5	22.0	56.8	64	28	10MS
SD2256	Era/ND469	7	27.3	20.3	23.8	58.5	69	33	5MR
SD2853	James/SD2049	8	24.0	17.0	20.5	51.7	63	31	0
SD2854	James/SD2049	9	29.9	21.3	25.6	53.9	65	31	T-5MR
SD2860	SD2167/SD2271	10	27.7	21.8	24.7	57.2	66	31	TMR
SD2861	Eureka/Prodax	11	30.4	15.3	22.8	55.4	63	28	5MS
SD2864	SD2201/Protor	12	27.6	15.0	21.3	57.7	68	31	TR
SD2865	SD2201/Protor	13	29.7	16.0	22.8	57.7	68	30	TMS
SD2868	Butte/SD2271	14	23.4	16.7	20.0	54.3	63	32	TMS
SD2881	Protor/RL6010	15	30.7	18.6	24.6	59.8	65	33	TMR
SD2882	James/SD2049	16	24.3	17.9	21.1	53.7	63	32	TMS
SD2884	SD2201/Protor	17	29.6	15.4	22.4	58.0	67	31	TMR
SD2899	SD3001/RL6005	18	26.8	18.3	22.5	56.3	64	31	5S
SD2902	Butte/2271//MN70170	19	24.9	15.7	20.3	53.7	63	31	TR
SD2903	SXW Composite	20	28.4	14.2	21.3	59.2	63	31	0
SD2911	Protor/RL6010//MN70170	21	29.2			57.4	66	30	0
SD2912	Protor/RL6010//MN70170	22	30.0			56.5	65	28	0
SD2914	SD3001/RL6005	23	30.0			57.2	64	31	5S
SD2916	Protor/RL6010	24	30.3			59.2	66	32	0
SD2917	Protor/RL6010	25	29.2			59.1	67	33	0
SD2918	Protor/RL6010	26	27.4			58.5	67	32	0
SD2919	James/SD2049	27	29.1			52.5	67	33	TMS
SD2920	Eureka/Prodax	28	29.6			55.4	63	29	TR
SD2921	Olaf/IAS-Assul	29	27.3			58.4	67	33	TR
SD2922	MN69124/3/Lu//Era/Tab	30	28.1			55.1	70	30	0
SD2925	Butte/James	31	32.2			56.3	64	30	TMR
SD2926	ND528/1117//IAS20	32	27.8			58.4	67	31	TMS
SD2927	ND528/1117//IAS20	33	23.2			56.1	66	31	TR
SD2929	SXW Composite	34	27.3			60.1	63	31	TMR
SD2930	Prd/8156//2355	35	28.2			58.5	65	33	TR
SD2931	Butte/SD2271	36	24.3			54.8	63	28	TMS
SD2932	Butte/SD2271	37	26.1			50.9	63	30	TMS
SD2933	Butte/SD2271	38	24.4			56.4	62	28	TMS
SD2934	Butte/SD2271	39	25.9			53.4	63	30	TMS
SD2935	Agt/3/ND441/WI0//BB	40	29.8			54.0	69	27	TR
SD2937	Hand/2*1809//ON/Tob	41	28.7			59.4	66	33	0
SD2939	SXW From Mexico	42	29.3			59.6	64	29	TMS
SD8015	Eureka/Dawn	43	24.6			54.3	64	27	0
SD8021	Coteau/Dawn	44	28.9			59.5	65	34	T-5MR
SD8026	Coteau/Dawn	45	29.7			56.5	62	30	TMS
SD9009	Goqui/4/.../3/Bgl "S"	46	26.8			47.0	65	39	TR
	Pavan 76	47	32.9			58.2	68	29	5MS
	Alex	48	25.5			56.7	67	32	TR
	James	49	26.2			54.4	63	31	5MS
Average			27.9				65.3	30.8	
C.V.			8.6				3.4	6.9	
$LSD_{.05}$			4.1						

TESTING EXPERIMENTAL OAT LINES

D. L. Reeves

The oat project had two sets of material tested at Highmore in 1981. Attached to the Standard Variety Oat Trials were six selections being considered for release as a variety. These same selections were also grown at seven other locations in South Dakota this year.

The second oat test which we had there this year was a Tristate nursery. The oat breeders in South Dakota, North Dakota and Minnesota are working together to provide testing in a wide range of growing conditions to early generation material that appears to have potential. Each state can test a maximum of ten entries each year. From the three state area, nine locations were selected with three in each state. The Central Research Station was selected as one of the sites where this nursery would be tested each year.

GRASS AND LEGUME FORAGE CROP YIELD TRIALS

A. Boe and R. Wynia

Seven yield trials, two each of bromegrass and intermediate wheatgrass and one each of crested wheatgrass, green needlegrass and alfalfa were planted in 1981. The planting area was packed before seeding and again after seeding. A V-belt seeder equipped with double disk openers and depth bands was used to plant the seed at a depth of 3/4 of an inch. Individual plot size was 4 x 25 feet. Planting rates were 10 grams pure live seed per plot for all grasses except green needlegrass, which was adjusted for variation in seed dormancy. Planting rate for alfalfa was 6 pounds per acre. A randomized complete block design with four replications was used for all trials.

Two cuttings were obtained from the 1977 alfalfa variety trial. Travois and experimental D-2 out-yielded Vernal and all others in 1981, and have the highest 3 year total yields. (See Table 23).

Table 22.

April 22	September 2	April 22	September 2
Rebound (SD) +	Cottonwood	Slate (Neb)	Slate
Lincoln (Neb)	Lincoln	Dahe (SD)	Dahe
Cottonwood (SD)		SD 52 (SD/Exp)	SD 54
		SD 54 (SD/Exp)	

Crested Wheatgrass
September 2

TXR Hyb (SD/Exp)
Nordan (ND, USDA)
Ruff (Neb)

Alfalfa
September 18

Travois (SD)
Vernal (Wis)
MT-1 (SD/Exp)
Super 721 (Cenex)
SX-10 (Sexauer)
Tetontravois (SD)*
Teton (SD)
Smith's +
Fosters +
D-2 Syn 3 (SD/Exp)
Daneb (SD/Heb/Exp)
Spredor II (Northrup King)

Green Needlegrass
September 18

Lodorm (ND, USDA)
Green Stipa (NO, USDA)
3-23 (SD/Exp)
4-25 (SD/Exp)
27-43 (SD/Exp)
31-19 (SD/Exp

+ Institution or company responsible for development of the respective available or experimental (Exp) varieties.

+ Old field collections from western South Dakota

* Blend of Teton and Travois.

Table 23. 1977 Highmore Variety Test South Dakota Agricultural Experiment Station.

Location:	Highmore, SD	Plot Size:	4' x 20'
Design:	RCB	Planting Date:	April 27, 1977
Method of Seeding:	V-Belt Drill	Replications:	4
Soil Type:	Glenham Loam	Years:	1978-1979, 1981

	Oven Dry Tons Per Acre			Three-Year Total	
	1978	1979	1981		%
Entry	1 cut	1 cut	2 cuts	T/A	Vernal
Kanza	1.49	1.94	2.38	5.81	97
Baker	1.45	1.88	2.38	5.71	95
Daneb 1	1.39	1.97	2.45	5.81	97
T_2-5 Syn-2	1.32	1.73	2.41	5.46	91
Vernal	1.68	1.84	2.48	6.00	100
Dawson	1.45	2.04	2.44	5.93	99
D2 Syn-2	1.55	1.98	2.69	6.22	104
Travois	1.47	2.11	2.71	6.29	105
Saranac	1.44	1.93	2.38	5.75	96
Mean	1.47	1.94	2.48	5.89	
L.S.D. (0.05)	NS	NS	.13		
C.V. (%)	19	12	6		

CHEMICAL CONTROL OF STALK-BORING INSECTS IN SUNFLOWERS

Dr. David Walgenbach, Terril Heilman, and Joe Gednalske

Stalk-boring insects and associated stalk-rot diseases appear to be common in sunflowers and may reduce potential seed yields. During the 1980 and 1981 growing seasons, the larvae of four insect species were commonly found in sunflower stems in South Dakota. This complex of stalk boring insects includes two stem weevils, Apion occidentale and Cylindrocopterus adspersus; one long-horned beetle, Dectes texanus; and one tumbling flower beetle, Mordellistena sp.

Little research has been done on the effect of these insects on sunflower seed yields or the potential for chemical control of insect larvae in the stem. An investigation was initiated at Redfield and other locations in 1981.

Three granular, systemic insecticides were applied at planting time: Furadan 10G, Counter 15G, and Temik 15G. Each of these was applied at several rates and with different placements i.e., (a) band over the seed furrow, (b) seed furrow, (c) subseed . An application of Counter 15G at first cultivation was also made.

The effectiveness of each insecticide, rate, and placement was determined by hand splitting of twenty sunflower stems (5 from each of 4 replications) from each of the chemical treatments. The species of insects present and a subjective rating of the severity of stalk-rotting (fungal infection) were recorded for each stem. Ratings of stalk-rot were as follows: 0 for stems with no fungal growth (no infection), 1 for stems with a light fungal growth in the pith only (light infection), 2 for stems with a fungal growth throughout the pith in one area of the stem (moderate infection), and 3 for stems with a complete destruction of the pith and partial destruction of vascular tissue by fungus in one area of the stem (severe infection). All stems were split and the above information recorded during the full bloom stage of the sunflowers.

The following Table 24 summarizes the results from tests at Brookings, Watertown, Redfield, and Highmore.

Table 24. Effect of Insecticide Treatments on the Percent of Sunflower Stems Infested (by any Insect Species) on the Severity of Stalk-Rots (Fungal Infection Rating), and on the Percent of Stalks Infested by Each of the Four Insect Species.

Treatment	Rate	Placement	% Stems Infested	Stalk Rot Rating	% of Stalks Infested by Species			
					Apion	Cylindrocopterus	Dectes	Mordellistena
Untreated	--		97	2.28	45	65	33	50
Furadan 10G	1.0 lb.	Furrow	85	1.55*	40	23*	20	43
Furadan 10G	1.5 lb.	Furrow	70*	1.38*	38	13*	10*	23*
Furadan 10G	2.0 lb.	Furrow	67*	1.18*	45	8*	20	13*
Furadan 10G	2.0 lb.	Band	70*	1.28*	50	13*	15	20*
Furadan 10G	1.0 lb.	Subseed	85	1.65	45	8*	30	33
Counter 15G	1.0 lb.	Band	72*	1.60*	50	23*	18	23*
Counter 15G	1.0 lb.	Furrow	75	1.75*	58	28*	12*	23*
Counter 15G	1.0 lb.	Cultivation	83	1.30*	63	10*	13	30
Counter 15G	1.0 lb.	Subseed	65*	1.00*	45	5*	10*	28*
Counter 15G	2.0 lb.	Band	72*	1.65*	58	40*	5*	33
Counter 15G	2.0 lb.	Furrow	60*	1.63*	38	23*	5*	20*
Counter 15G	2.0 lb.	Cultivation	57*	1.30*	33	13*	3*	17*
Counter 15G	2.0 lb.	Subseed	30*	0.83*	15*	8*	8*	5*
Temik 15G	1.0 lb.	Furrow	97	1.95	52	30*	33	38
Temik 15G	0.5 lb.	Furrow	97	2.05	33	40*	45	33

Most stalks were infested by more than one insect species.

* Means followed by an asterisk were significantly different from the untreated mean in the same column of the table at the .05 probability level.

Few of the chemical treatments had a major effect on the percentage of stalks infested (by any insect) or on the percentage of stalks infested by the stem weevil, Apion occidentale. The only exception to this was Counter 2 lb. subseed, which gave excellent control of all insects. Several of the treatments significantly reduced the percentage of stalks infested by the other insect species, particularly the stem weevil, Cylindrocopterus adspersus and the long-horned beetle, Dectes texanus. The same treatments were also effective in reducing the severity of stalk rots in the stem. The placement of the chemical appeared to be more important than the rate. Generally, subseed placement of Counter and first cultivation application of Counter were the most effective treatments at the lower rates. At higher rates, Counter subseed, Counter cultivation, and Furadan in furrow produced equal or greater control of most insects and somewhat less stalk-rot. It should be noted that Furadan was not applied subseed at higher rates. Also, the difference in insect control or severity of stalk-rot between the lower and higher rates of the insecticides may not be economically important.

No significant differences in seed yield were found at Watertown, where there was a light infestation of stalk-boring insects. The test crops at other locations, including Redfield, were damaged by high winds, other insects and or birds prior to harvest, so differences in seed yield could not be measured. Yield tests will be repeated in 1982.

Some recent research done by C.E. Rogers on sunflowers in Texas indicates that heavy infestations of the stem weevil, Cylindrocopterus adspersus can reduce seed yields by stunting plant growth and or through lodging of the plants before harvest. Other research done by J.H. Hatchett, et al. on the long-horned beetle, Dectes texanus, indicates that this insect uses both sunflowers and soybeans for host plants, and it has caused significant soybean yield losses in Missouri. Soybean yield losses have resulted from lodging of the plants before harvest or from harvesting losses when stalks break off too easily to properly feed into a combine. Crop losses have not yet been attributed to either the stem weevil, Apion occidentale, or the tumbling flower beetle, Mordellistena sp.

Since all four of these insects are natural pests of wild sunflowers and do overwinter in South Dakota, one or more these species may increase in number with continued cultivation of domestic sunflowers. Future research on these insects in South Dakota will help determine their effect on sunflower seed yields and what control measures are the most effective. Despite the loss of yield information in 1981, two important discoveries were made toward those goals. First, it is now evident that these stalk-boring insects are associated closely with stalk-rot diseases. Second, granular insecticides can be used effectively to control these insects and to reduce the occurance of stalk-rot diseases.

THE CHEMICALS USED IN THIS STUDY ARE NOT REGISTERED FOR USE ON SUNFLOWERS IN SOUTH DAKOTA. REGISTRATION OF FURADAN AND COUNTER MAY OCCUR WITHIN THE NEXT TWO OR THREE YEARS.

ANNUAL REPORT
HORTICULTURE-FORESTRY DEPARTMENT PROJECTS
CENTRAL RESEARCH STATION
HIGHMORE, SOUTH DAKOTA

Woody Ornamentals (Report by L. Helwig and N. Evers)

On May 8, 1981, nine tree species, six shrub species and one evergreen species were added to the woody plant trials at the Central Research Station. One, five and ten year evaluations were recorded as required by NC-7. Additional evaluations were made on all other plantings. At present there are 52 trees, 43 shrubs, 14 conifers, 11 herbaceous perennials and one vine under evaluation.

In ten years of evaluation the plants which look best include the Dwarf Redtwig Dogwood (Cornus stolonifera 'Isanti'): Black Chokeberry (Aronia melanocarpa); European Cranberry Bush (Viburnum opulus); Redcap Burning Bush (Euonmus europea 'Redcap'); Broom (Genista multibracteata); Hybrid Forsythia (X Forsythia); Sweetberry Honeysuckle (Lonicera caerulea #13); and Pinks (Dianthus plumaris #1).

The Hybrid Forsythia (X Forsythia) has looked especially good at all three NC-7 evaluation sites in South Dakota and is currently being propogated and is under consideration for release.

In the last decade one of the most limiting factors in survival of woody ornamentals was rabbits. Without some form of protection, few if any of the woody plants (deciduous and coniferous) would have much of a chance for survival. The combined use of repellants, tree wrap and hunting has been the most effective control.

In 1982 we will add additional plants to the woody plant trials and explore the possibility of using drip irrigation.

Fruit (Report by R. Peterson)

In the spring of 1975 Redwell, Fireside and Haralson applies on standard roots; Fireside and Haralson on M7 (dwarfing) roots; Dietz plum; Meteor sour cherry; Luscious and South Dakota selection 67S12 pears; and Ogalalla strawberries were planted. Later Hazen apples, Fall Red raspberries, 2 South Dakota grape selections and Sparkle strawberries were planted. The entire fruit planting has been irrigated during dry weather. The apples have not yet fruited. Three years ago rabbits caused severe damage to all the fruit trees but they have recovered well.

Dietz plum bore heavy crops of fruit in 1980 and 1981. Dietz plum is a European plum and differs from American type plums in that Dietz is very good for cooking as well as for eating as a fresh fruit. Dietz plum also differs from American type plums in that Dietz is self fertile so a single tree is capable of setting a heavy crop of fruit. The good performance of Dietz plum at the Central Research Station suggests that it should be considered for home plantings in central South Dakota.

The Ogalalla everbearing strawberry and Sparkle junebearing strawberry have also performed well at the Central Research Station, but Ogalalla is known to be the more hardy of these two strawberries. Sparkle is outstanding both for fresh fruit and for freezing.

SHEEP
RAM TEST STATION RESULTS

J. M. Thompson

Date for the Spring 1981 and Fall 1980 ram tests conducted at the Central Research Station in Highmore are presented in Tables 25 and 26, respectively. The fall test is primarily for wool breeds and the spring test for meat type breeds.

The following formula was used to index the rams in the fall test period: I = 60 x (ADG) + 4.0 x (staple length) + 4.0 x (clean wool) - 2.7 x (face cover score) - 4.0 x (skin fold score).

The following formula was used to index the rams in the spring test period: I = 60 x (ADG) + 30 (weight per day of age) + 5 x (muscle score) - 5 x (fat score) - 5 x (soundness score).

In the 1980 fall test 17 producers entered 86 rams and 29 producers entered 98 rams in the spring 1981 test. For the fall 1981 test period 73 rams were started on test for completion in March 1982. Results of this test and others will be presented in future Central Research Station reports.

Table 25. Results of Spring 1981 Test.

Breed	No.	Total Gain (lb)	ADG (lb)	Fat Score	Muscle Score	Soundness Score	Index
Suffolk	41	82.73	.91	2.2	7.2	1.8	97.86
Hampshire	8	74.0	.81	2.5	7.5	1.5	93.7
Columbia	10	75.5	.83	2.1	5.8	1.4	86.95
Rambouillet	25	68.58	.75	2.0	5.6	1.0	80.4
Targhee	10	73.4	.81	2.2	5.7	1.3	83.87
Montadale	4	58.5	.65	3.0	7.8	1.0	81.22

Table 26.

Breed	No.	Total Gain (lb)	ADG (lb)	Adj. 365 day Grease Fl. Wt. (lb)	Adj. 365 day Clean Fl. Wt. (lb)	Adj. 365 day Staple Length (in)	Face Score	Wrinkle Score	Index
Rambouillet	61	102	.69	22.45	11.14	4.42	1.99	1.78	89.85
Columbia	5	116	.78	25.82	13.39	5.02	1.9	1.0	108.53
Targhee	14	106	.72	22.04	11.22	4.65	1.36	1.11	98.57
Suffolk	3	102	.72	11.18	5.86	3.64	1.0	1.0	73.09